

Protecting Salmon Summer 2017

Posted on [June 5, 2017](#) by [Tom Cannon](#)

In a [June 2 post](#)¹ I wrote about protecting Sacramento River salmon and sturgeon in spring 2017. The topic shifts to summer in this post. Summer (July-September) river conditions are also important for sustaining salmon and sturgeon. There are numerous sensitive summer life-history stages with well recognized tolerance limits:

- Adult holding and spawning winter-run salmon. (July-August 60°F)
- Eggs and embryo winter-run salmon. (July-Sept 56°F)
- Rearing fry and fingerling winter-run salmon. (July-Sept 60°F)
- Rearing fingerling and pre-smolt late fall-run salmon. (July-Sept 60°F)
- Over-summering and migrating spring-run and fall-run salmon smolts and juvenile sturgeon. (July-Sept 65°F)
- Migrating pre-spawning adult spring-run and fall-run salmon. (July-Sept 68°F)
- Holding pre-spawning adult spring-run and fall-run salmon. (July-Sept 60°F)
- Spawning adult spring-run salmon. (Aug-Sept 56°F)

State water right orders, federal salmon biological opinions, and the Sacramento River Basin Plan all recognize these uses and tolerances by setting summer water temperature targets of 56°F for the Red Bluff (river mile 243) reach and 68°F at Wilkins Slough (river mile 125). Further conditions are set upstream as far as Keswick Dam (river mile 300).

In this post, I focus on the summer spawning run of fall-run salmon of the Sacramento River. Fall-run make up the vast majority of Sacramento River salmon, as well as the Central Valley salmon population. Better summer conditions in 2017, especially with a record-high water supply, should help produce more salmon and bring about a recovery of the depressed ocean and river fisheries.

Adult fall-run migrate from the ocean through the Bay-Delta and begin spawning in the upper river (river mile 200-300) in September continuing through December. Summer river conditions during their upriver spawning run, pre-spawn holding, and spawning are important factors in the ultimate success of the spawning run (i.e., smolt production and future runs).²

To protect the spawning run we should focus on two key objectives:

1. Maintain water temperature below 60°F in the spawning reach to protect holding adult salmon.
2. Maintain water temperature below 68°F in the migrating corridor to protect migrating adult salmon.

¹ <http://calsport.org/fisheriesblog/?p=1660>

² <http://calsport.org/fisheriesblog/?p=1586>

Spawning Reach Summer Protection

The fall-run spawning reach is from Hamilton City upstream to Keswick Dam: river mile 200 to 300 (Figure 1). Spawning winter-run are protected with a 56°F daily-average limit above Balls Ferry (RM 276). With potentially over half the fall-run spawning below Balls Ferry, a 60°F limit is needed down to Hamilton City (RM 200). Historical water temperatures at Red Bluff (RM 243) show that the Basin Plan 56°F target at Red Bluff was rarely achieved, but that the 60°F limit was achieved except in some critically dry years (Figure 2). Allowing for a 2-degree leeway to maintain the 60°F limit downstream 40 miles to Hamilton City, a 58°F limit was not achieved except in some wetter years. Maintaining a 60°F limit at Hamilton City would take flows of 10,000 cfs or more at Red Bluff (Figure 3).

Migrating Reach Summer Protection

The fall-run migration reach to the spawning grounds above Hamilton City (RM 200) is approximately 100 miles above the mouth of the Feather River at Verona. Historical water temperature data from the Wilkins Slough gage (RM 125) show that the 68°F daily average objective was often not met, especially in critically dry years (Figure 4). Maintaining a 68°F limit near Wilkins Slough in the lower Sacramento River would take flows of 7,000 cfs or more at the Wilkins Slough gage (Figure 5). Maintaining a 68°F limit at Verona below the mouth of the Feather River would take up to 15,000 cfs at the Verona gage (Figure 6).

Conclusions and Recommendations

- Maintain summer water temperature at Red Bluff below a daily-average limit of 58°F with flows from 10,000 to 12,000 cfs as necessary, to protect holding pre-spawn and early spawning adult fall-run salmon.
- Maintain summer water temperature at Wilkins Slough on the lower Sacramento River below a daily-average limit of 68°F with flows from 7000 to 8000 cfs as necessary, to protect migrating adult fall-run salmon.
- Maintain summer water temperature at Verona on the lower Sacramento River below a daily-average limit of 68°F with flows from 10,000 to 15,000 cfs (including Feather River flows) as necessary, to protect migrating adult fall-run salmon.

These recommendations are consistent with [Basin Plan objectives](#)³ for Sacramento River water temperature.

³ https://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/sacsjr.pdf

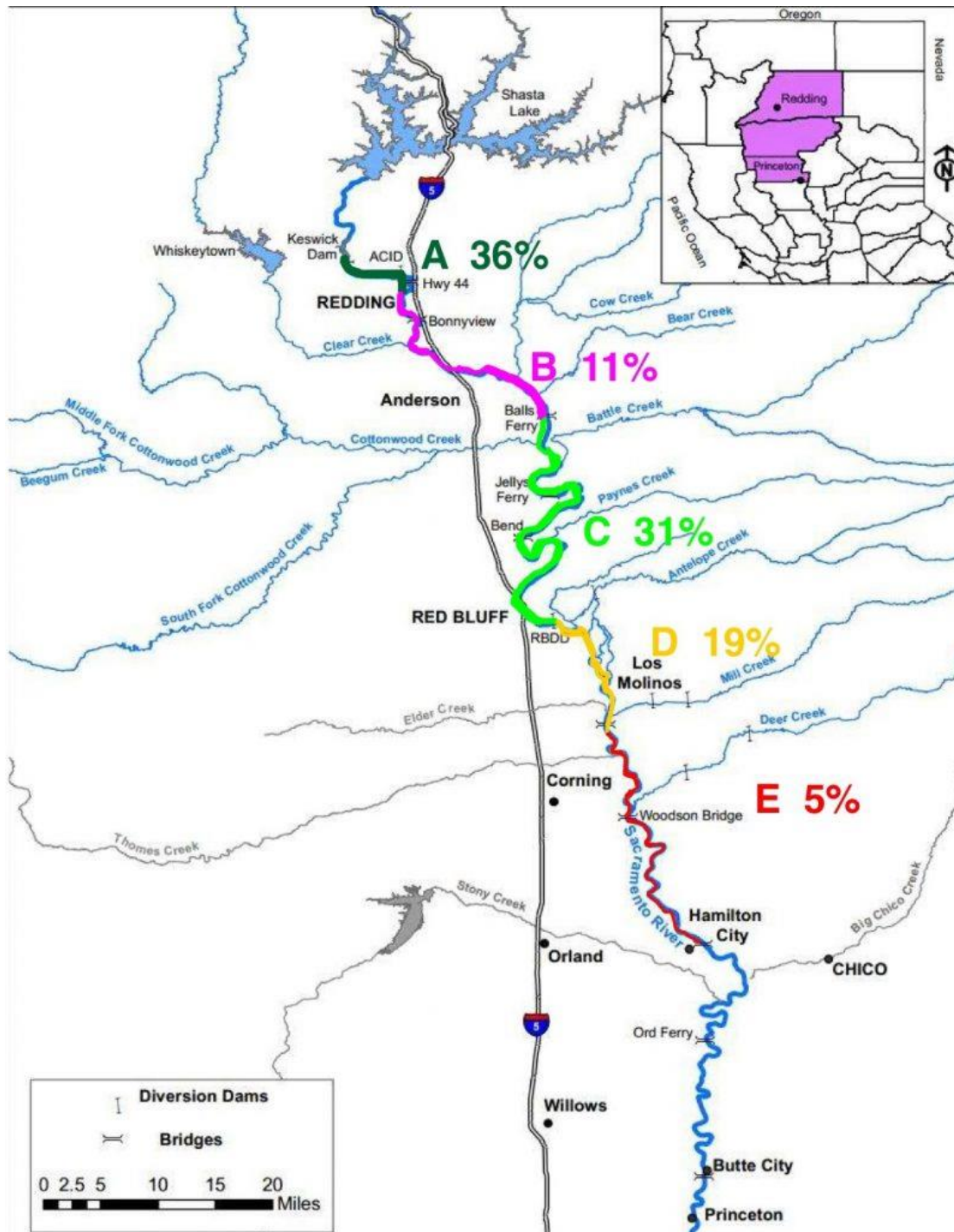


Figure 1. Sacramento River salmon spawning reaches: Keswick Dam (rm 300) downstream to Hamilton City (rm 200). The proportion of the total salmon spawning is shown by five river segments (A-E). Source: <http://www.calfish.org/ProgramsData/ConservationandManagement/CDFWUpperSacRiverBasinSalmonidMonitoring.aspx>.

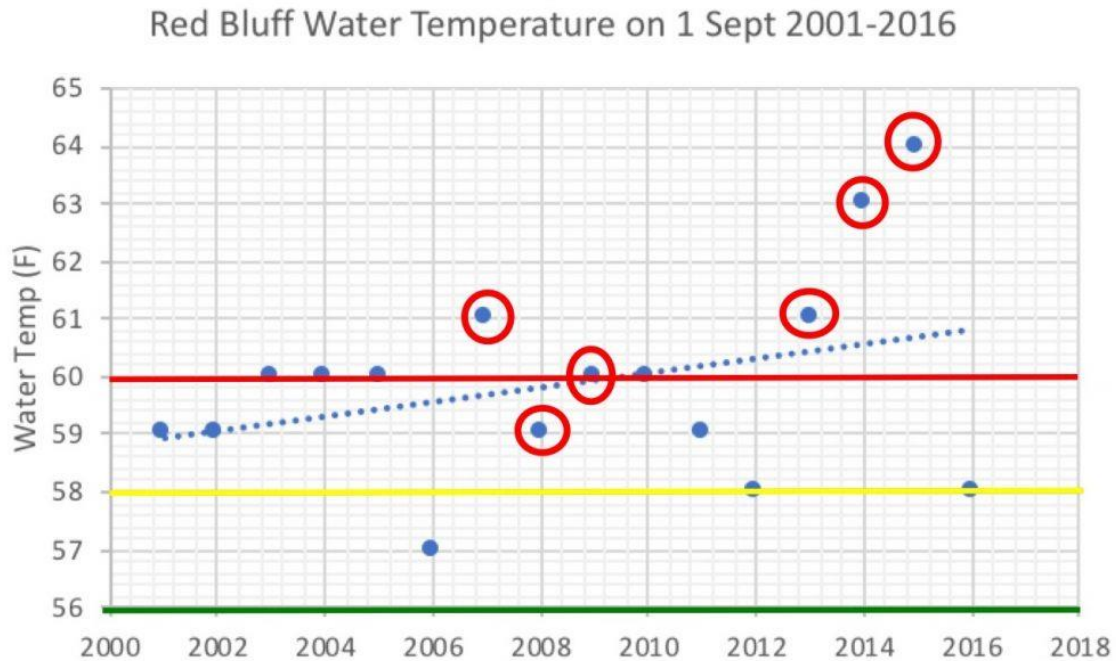
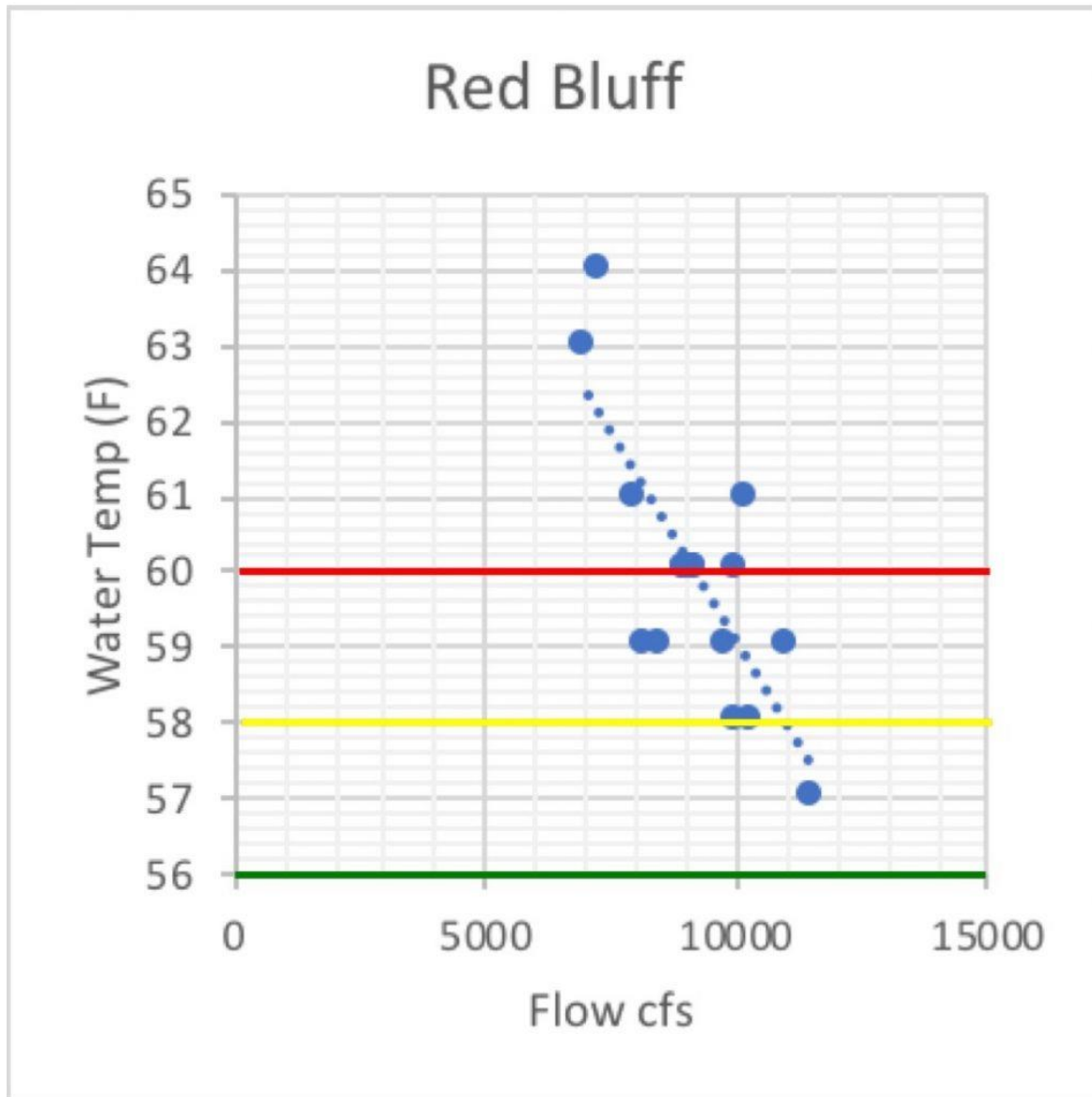


Figure 2. Daily average water temperature of the Sacramento River at Red Bluff (rm 243) on September 1 2001-2016. Red circles denote critical water years. Red line denotes upper tolerance limit for holding prespawn adult salmon. Yellow line denotes Red Bluff level necessary to meet objective at Hamilton City (rm 200). Green line denotes Basin Plan objective for Red Bluff.



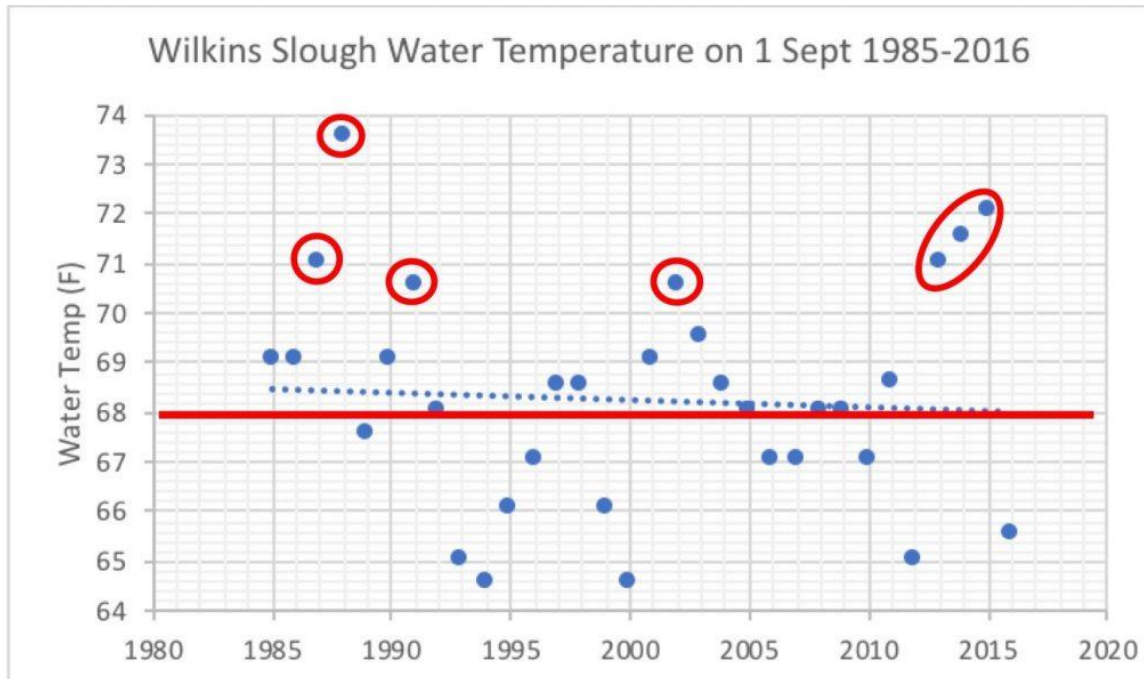


Figure 4. Daily average water temperature of the Sacramento River at Wilkins Slough (rm 125) on 1 September 1985-2016. Red circles denote critical water years. Red line denotes upper tolerance limit for holding prespawn adult salmon.

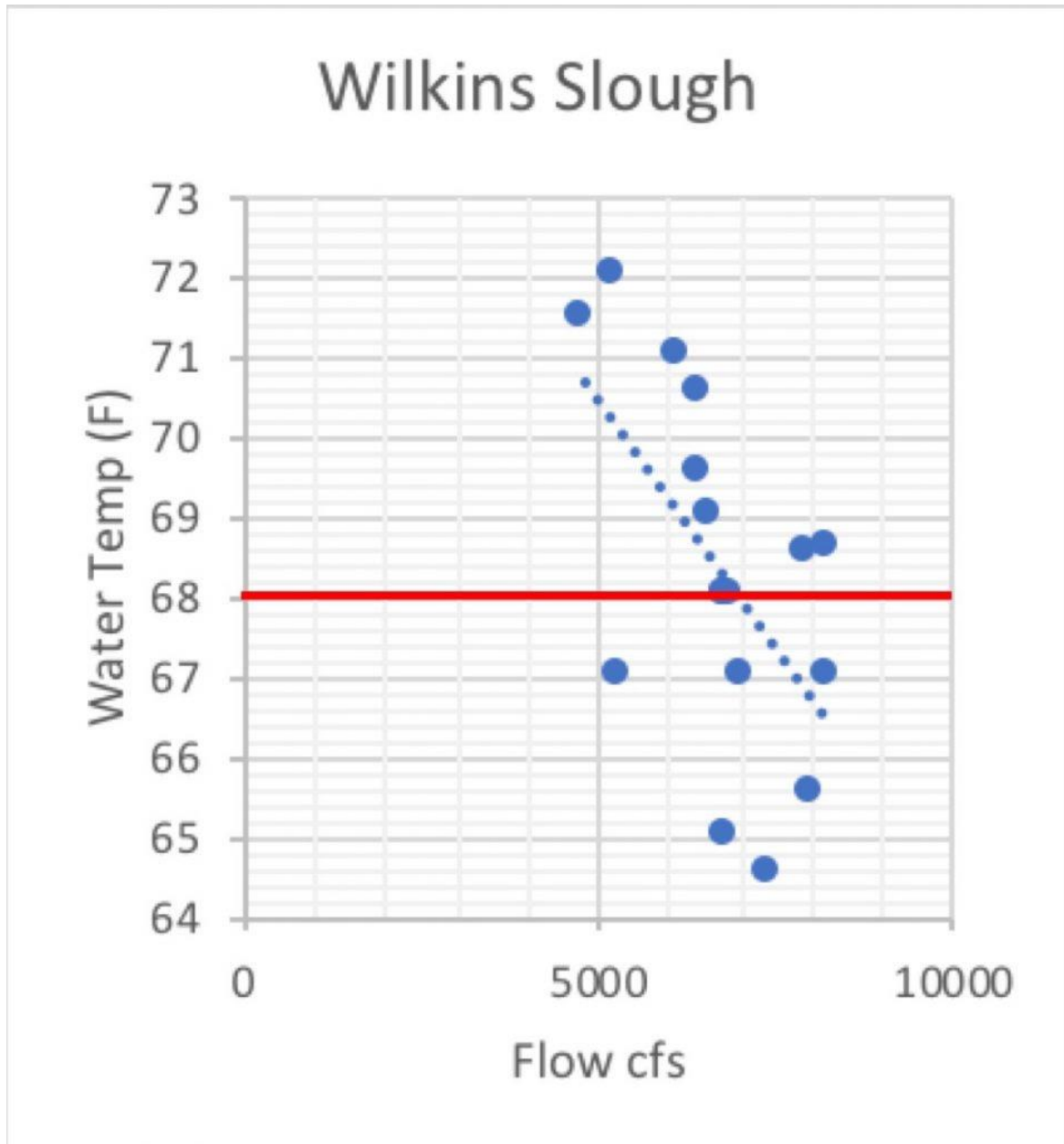


Figure 5. Daily average water temperature of the Sacramento River at Wilkins Slough (rm 125) on September 1 1985-2016. Red line denotes upper tolerance limit for holding prespawn adult salmon.

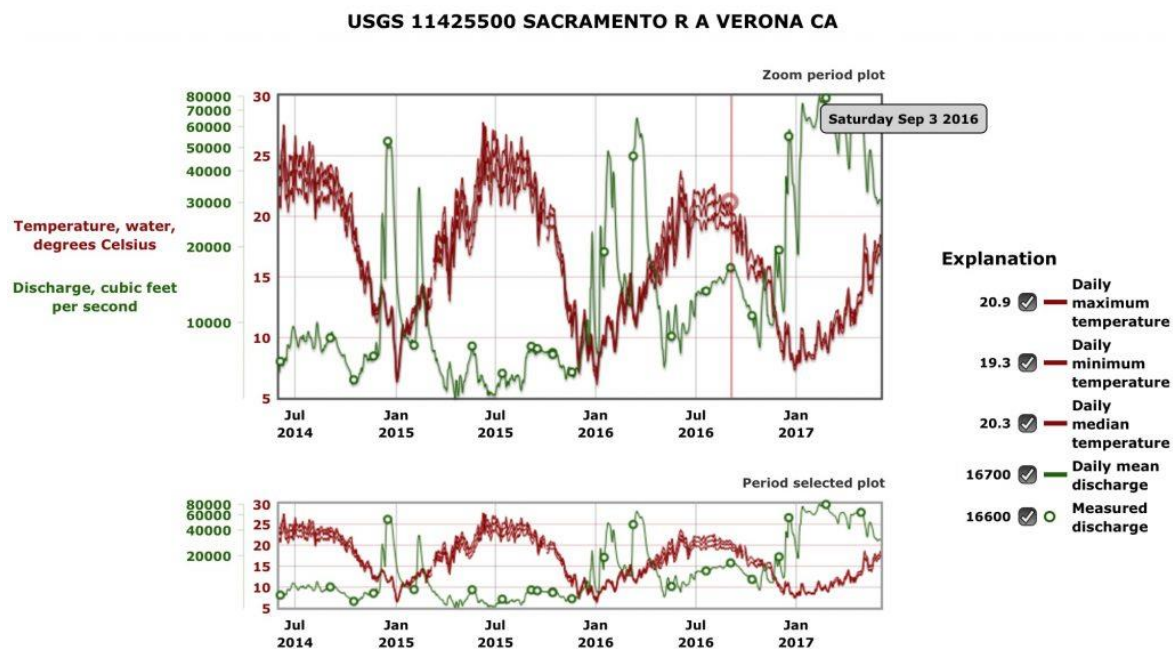


Figure 6. Water temperature ($^{\circ}\text{C}$) and flow (cfs) of the Sacramento River at Verona (rm 80) from July 2014 to June 2017. Source:

https://waterdata.usgs.gov/nwis/dv?cb_00010=on&cb_00060=on&format=gif_mult_parms&site_no=11425500&referred_module=sw&period=&begin_date=2014-06-01&end_date=2017-06-03